Calibration Integration Procedure

I. Purpose:

The purpose of this procedure is to describe the steps that the RESET team uses to integrate calibration procedures at the ARCS. This procedure describes how to select which calibration procedure to implement and how to document the results as a function of weather conditions at the ARCS.

II. Cautions and Hazards:

- All operators should be aware of hazards associated with changing weather conditions.
- See cautions and hazards associated with each calibration procedure.

III. Requirements:

- ARCS RESET Members - (2)
- All current RESET calibration procedures and calibration forms. (If you do not have these, contact the TWPPO at 505-667-1186 (U.S. only) and request an e-mail or faxed copy of most recent version.)
- Note: Some of the following tasks require preparation at least one day in advance.
- Adequate weather reports or on site observation.

IV. Procedure:

A. General Procedure:

See Attachment 1 for this work process flow diagram.

1. Download configurations from SKYRAD, GNDRAD, SMET, MWR, CEIL, WSI, TRK, BBSS, and AERI using the following name conventions, where date is day configurations downloaded:
    - SKYYMMDD.CFG
    - GNDYMMDD.CFG
    - METYMMDD.CFG
    - MWRYMMDD.CFG
    - CEIYMMDD.CFG
    - WSIYMMDD.CFG
    - TRKYMMDD.CFG

- BBSSYMMDD.CFG
- AERIYMMDD.CFG

Note: See downloading logger configurations from ADaM in section B below.

2. Create directory on ftp.twppo.lanl.gov called RESET #, with subdirectories for Manus,Nauru (and Darwin when applicable) with subdirectories for Configs,Records(calforms, replacement, daily reports,Audit-in/out forms), Data (netcdf, and raw with folders for each instrument).

   Send records, data and configurations to ftp.twppo.lanl.gov DATA and CONFIGS directories (User ID reset and “double nickel “ password).Send data and configurations to ftp.twppo.lanl.gov DATA and CONFIGS directories (User ID reset and “double nickel “ password).

   Note: it is important that the mentors be notified quickly that the data are there for them to look at.

3. Calibrate Cal Logger (procedure PRO(DAQC)-001).
4. Set up radiometers, PIRS, PSPs, NIPs, and MFRSR to replace the SKYRAD instruments on calibration stand and invert GNDRAD PSP & PIR.
5. Collect at least one day’s data (more if cloudy, but leave enough time to complete another comparison after instruments replaced).
6. Collect sample data both raw data from SKYRAD, GNDRAD, SMET, Cal Logger, mfrsr, mwr, BBSS, and netcdf data from the mpl, and vceil, , also collect configurations for the CalLogger, mfrsr, mpl, AERI, WSI, vceil, MWR, and BBSS, sending configurations to ftp.twppo.lanl.gov/RESET.
7. Notify TWPPO that data were deposited for mentor inspection.
8. Concurrently with Step 6 above and depending on the weather conditions, perform calibrations as described in Steps C, D, E, and F and proceed to Step 14 below while radiation comparison is continuing.
9. Also concurrently with Step 6 above, begin SKYRAD and GNDRAD logger calibration during the comparisons but do not change calibration coefficients until comparison is completed.
10. If the mentor accepts that the results of the first comparison show that the replacement instruments are OK, replace SKYRAD instruments with comparison instruments.
11. Replace comparison instrument with spares.
12. Collect another comparison data set.

13. If the mentor accepts the comparison results, document results on cal form; if not, follow mentor's suggestions. (see Attachment 8 RESET Calibration Records Completed to Date. Calibrations are also performed as part of Integration).
14. Repeat Steps 1 through 3 above and send cal forms to ftp.twppo.lanl.gov/RESET/RESET#.
15. If the mentor does not accept that the results of the first comparison show that the replacement instruments are OK, replace comparison instruments with spares.
16. Return to Step 6 above.

B. Downloading Logger Configurations from ADaM:

1. Obtain the configuration using *zenocom* by opening a window on ADaM, e.g., right click and type:

   /apps/bin/zenocom –u /config/xxxxxx

   where xxxxx is gndrad, skyrad or smet (there is about a 1 minute delay).
2. Retrieve the configuration file from:

   /config/xxxxxx/config_sav/

   It will have a name like *TWP-Manus-skyradyyyymmddhhmmss.cfg.*
3. Make a copy of the configuration file on floppy disk by inserting a formatted floppy disk and typing:

   volcheck -v

   cd /floppy/unnamed_floppy

   cp /config/skyrad/congig_sav/filename /floppy/unnamed_floppy

   (The above works from any directory, you do not need a floppy directory structure if in *unnamed* floppy directory.)

C. Weather Conditions:

See Attachment 2 for this work process flow diagram.

1. If possible, consult Weather Service for forecast of date or period most likely to contain as clear a day as possible during the RESET visit.
2. Use this high-level procedure depending on the local weather conditions at the time of the RESET visit. This is broken down into four possible Steps:
   - Clear-sky day.
   - Cloudy, low-wind day, no chance of rain during calibration period.
   - Cloudy day, periods without rain.

- Rainy periods (rain needed or performed in laboratory capability).

3. Accomplish all four of the listed Steps at least once during the RESET visit (weather permitting).

D. Clear-Sky Day:

See Attachment 3 for this work process flow diagram.

1. Assemble copies of the most recent versions of the procedures and corresponding record forms below:

   - PRO(MWR)-005, MWR Field Tipping Curve Method Calibration (CALF) and FM(MWR)-001.
   - PRO(NIP)-002, NIP Calibration Procedure Using a Cavity Radiometer (CALF) and FM(NIP)-001 (optional).
   - PRO(PSP)-006, PSP Calibration Using Shade/Unshade Method (CALC) and FM(PSP)-001.
   - PRO(PSP)-007, PSP Calibration Using Alternate Method (CALC) and FM(PSP)-002 (not yet implemented).
   - PRO(RSR)-004, MFRSR Calibration Comparison Check (CALC) and FM(RSR)-001.
   - PRO(RSR)-006, MFRSR Langley Calibration Check Procedure (CALF) and FM(RSR)-007.

2. Prepare the following at least one day in advance:

   - Set up and align spare PIR and PSP or MFRSR on SKYRAD extension stand.
   - Set up and align spare NIP or Cavity Radiometer on the Brusag Tracker (if used).
   - Run 110 V power line to SKYRAD stand with sufficient power for two laptops, cavity controller, and calibration datalogger.

     IMPORTANT: Make sure that the time is properly set on the calibration datalogger.

   - (Optional) Collect the following special equipment needed to accomplish the above procedures:

     a) Cavity radiometer

     b) Cavity control unit and cables

     c) Laptop computer

     d) Protective enclosure for laptop and control unit and tools

     e) Calibration datalogger

f) Laptop for reading data from calibration datalogger or MFRSR

- The following are optional (not performed at the present time):

a) Check level of MWR, document, and relevel. if necessary.

b) Check communication between the MFRSR and a laptop with DOSBAND.

c) Initialize the spare MFRSR and begin data collection.

- Check communication between the Cavity, Cavity control unit, and its laptop.
- If reference radiometers are not set up, set up reference instruments and log data on calibration data logger following procedure PRO(RAD)-001.
- Cover calibration equipment and protect from rain or condensation.

3. (Optional) Perform the following steps as early as possible on the day of test:

   - Mount the Cavity radiometer and begin data collection.
   - If necessary, reset the MWR for the tipping mode calibration configuration.

4. During a period from mid-morning to noon, i.e., before convective clouds are likely to form, begin the shade/unshade calibration check (see procedure PRO(PSP)-006).

   Note: The below activities are not yet implemented.

5. Perform the following at sunset:

   - If weather forecasts (or on-site observation) indicate that the next day (preferably in the morning) will also be clear, or likely to be clear, repeat steps 3 through 5.
   - At the end of the second day, or first day if clouds are expected the next day, prepare for Forgan alternate calibration procedure PRO(PSP)-007, as follows:

     a) Switch shaded and unshaded PSPs,

     b) Switch serial numbers and sensitivity numbers on data logger configurations,

     c) Fill out Instrument Replacement and Configuration Change Record, FM(OPS)-008

     d) Document switch in site data log.

- After period of clear weather, remove calibration equipment, except reference radiometers, and store them.

Record of Events:

6. Fill out the following calibration record forms for OMS (brackets indicate associated procedures):
   - FM(MWR)-001 [PRO(MWR)-005]
   - FM(NIP)-001 [PRO(NIP)-002]
   - FM(PSP)-001 [PRO(PSP)-006]
   - FM(DAQS)-005 [PRO(DAQS)-005]

E. Cloudy, Low-Wind Day, No Chance of Rain During Calibration:

See Attachment 4 for this work process flow diagram.

1. Before cloudy days with low chance of rain, assemble the following calibration procedures:

   Record of Events:

   - PRO(DAQC)-001, ARCS Calibration Logger (CAL).
   - PRO(DAQR)-001, ARCS GRNRAD and SKYRAD Datalogger Calibration (CALF).
   - PRO(DAQM)-005, ARCS SMET Data Logger and Sensor Calibration (CALF).
   - PRO(TRH)-006, SMET Temperature/Humidity Field Calibration (CALF).
2. Set up awning in advance.
3. Lower SMET mast (at least three people are needed to lower mast).
4. Perform the following procedures:
   - PRO(DAQR)-001
   - PRO(DAQS)-004
5. Complete the following calibration record forms for OMS (brackets indicate associated procedures):

   Record of Events:

   - FM(DAQC)-001 [PRO(DAQC)-001]
   - FM(DAQM)-001 [PRO(TRH)-006]
   - FM(DAQR)-001 [PRO(DAQR)-001]
   - FM(DAQM)-001 [PRO(DAQM)-005]

F. Cloudy Day, Periods of No Rain:

See Attachment 5 for this work process flow diagram.

1. Assemble the following calibration procedures in advance:
   - PRO(CEI)-002, Ceilometer Field Calibration Procedure (CALF)
   - PRO(IRT)-005, IRT Blackbody Calibration Procedure (CALC)
   - PRO(MPL)-015, MPL OVERLAP Correction Calibration Check (CALC)
   - PRO(RAD)-001, Radiometer Calibration Using Comparison Instruments (CALC)
2. Complete the above procedures as time permits.
3. Complete the following calibration record forms for OMS (brackets indicate associated procedures):

   Record of Events:

   - FM(CEI)-001 [PRO(CEI)-002]
   - FM(IRT)-001 [PRO(IRT)-005]
   - FM(MPL)-001 [PRO(MPL)-015]
   - FM(RAD)-001 [PRO(RAD)-001]

G. Rainy Periods (Rain Needed or Perform in Laboratory):

See Attachment 6 for this work process flow diagram.

1. Assemble the following calibration procedures in advance:
   - PRO(MPL)-013 MPL Optical System Calibration Check (CALC)
   - PRO(MPL)-014 MPL Pulse Calibration (CALF)
   - PRO(ORG)-003 Optical Rain Gauge Calibration Check (CALC)
   - PRO(TRH)-003 Vaisala HMK11 Humidity Calibrator to check TRH Probes (CALF)
   - PRO(DAQR)-001, Datalogger Calibration (for spare loggers)
2. Complete the above procedures as time permits.
3. Complete the following calibration record forms for OMS (brackets indicate associated procedures):

   Record of Events:

   - FM(MPL)-002 [PRO(MPL)-013]
   - FM(MPL)-003 [PRO(MPL)-014]

- FM(DAQM)-001 [PRO(DAQM)-005]
- FM(TRH)-002 [PRO(TRH)-003]
- FM(DAQR)-001 [PRO(DAQR)-001 (spare instruments)]

4. Copy checklist sheets and FAX to TWPPO.

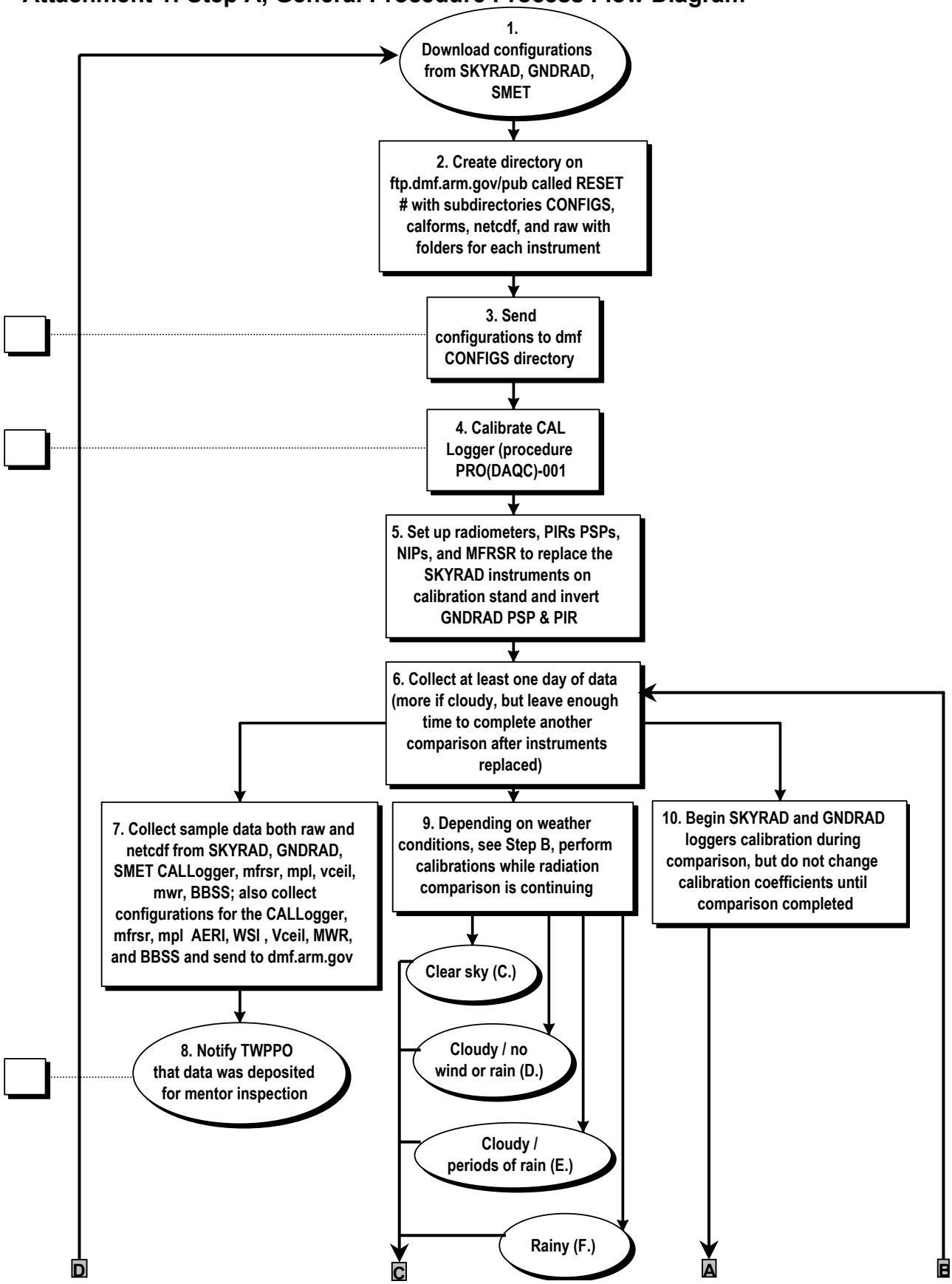
V. References:

See references for individual calibration procedures.

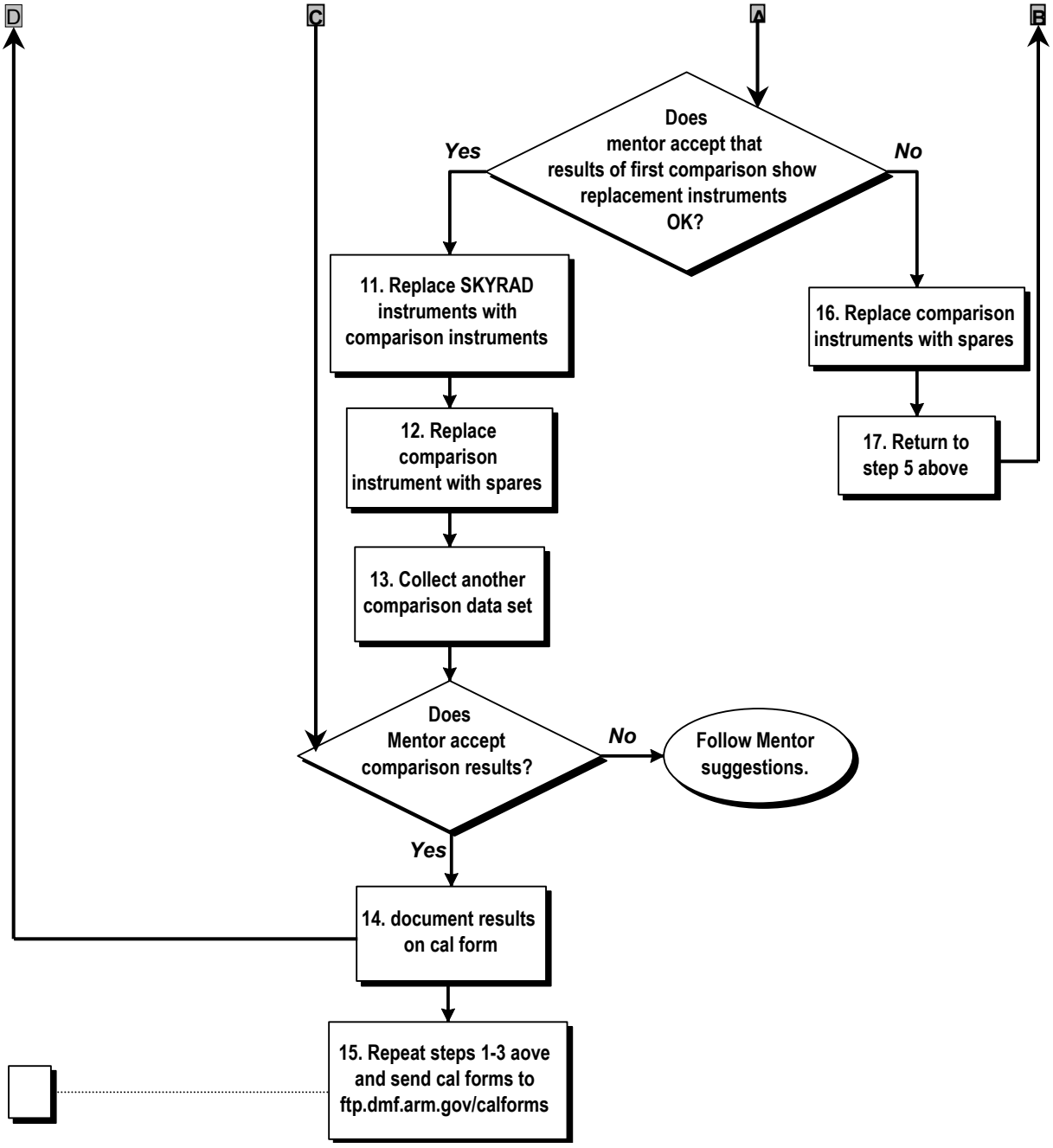
VI. Attachments:

1. Attachment 1: Step A, General Procedure Process Flow Diagram
2. Attachment 2: Step B, Downloading Logger Configurations from ADaM Process Flow Diagram
3. Attachment 3: Step C, Weather Conditions Process Flow Diagram
4. Attachment 4: Step D, Clear-Sky Day Process Flow Diagram
5. Attachment 5: Step E, Cloudy Low-Wind Day, No Chance of Rain During Calibration Process Flow Diagram
6. Attachment 6: Step F, Cloudy Day, Periods of No Rain Process Flow Diagram
7. Attachment 7: Step G, Rainy Periods (Rain Needed or Perform in Laboratory) Process Flow Diagram
8. Attachment 8: RESET Calibration Records Completed to Date

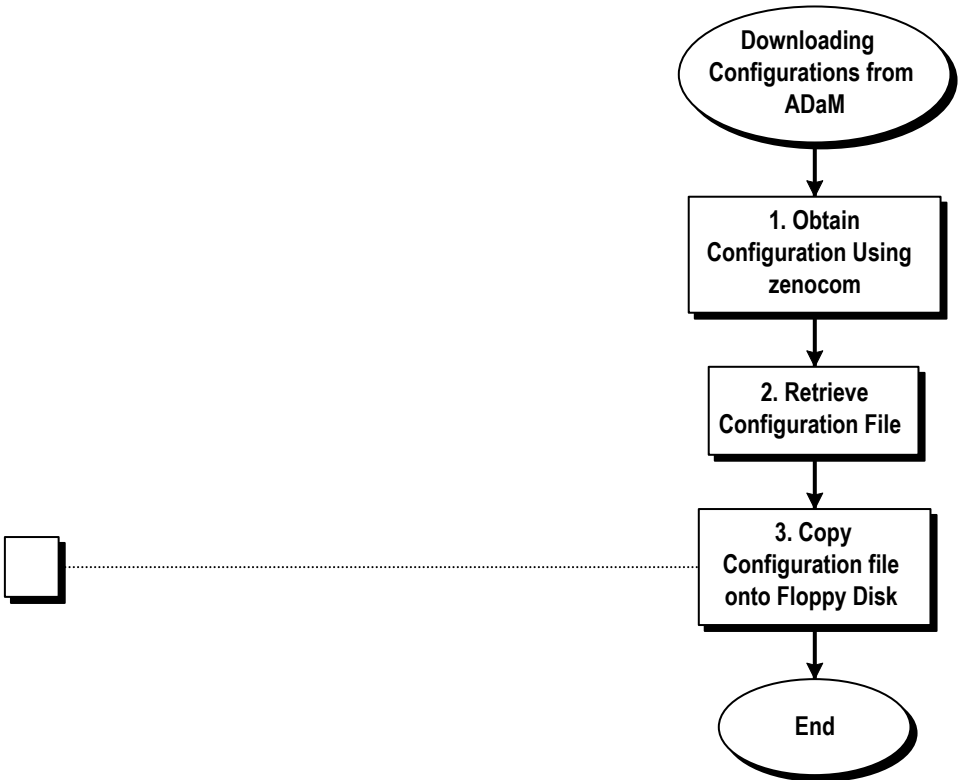
Attachment 1: Step A, General Procedure Process Flow Diagram



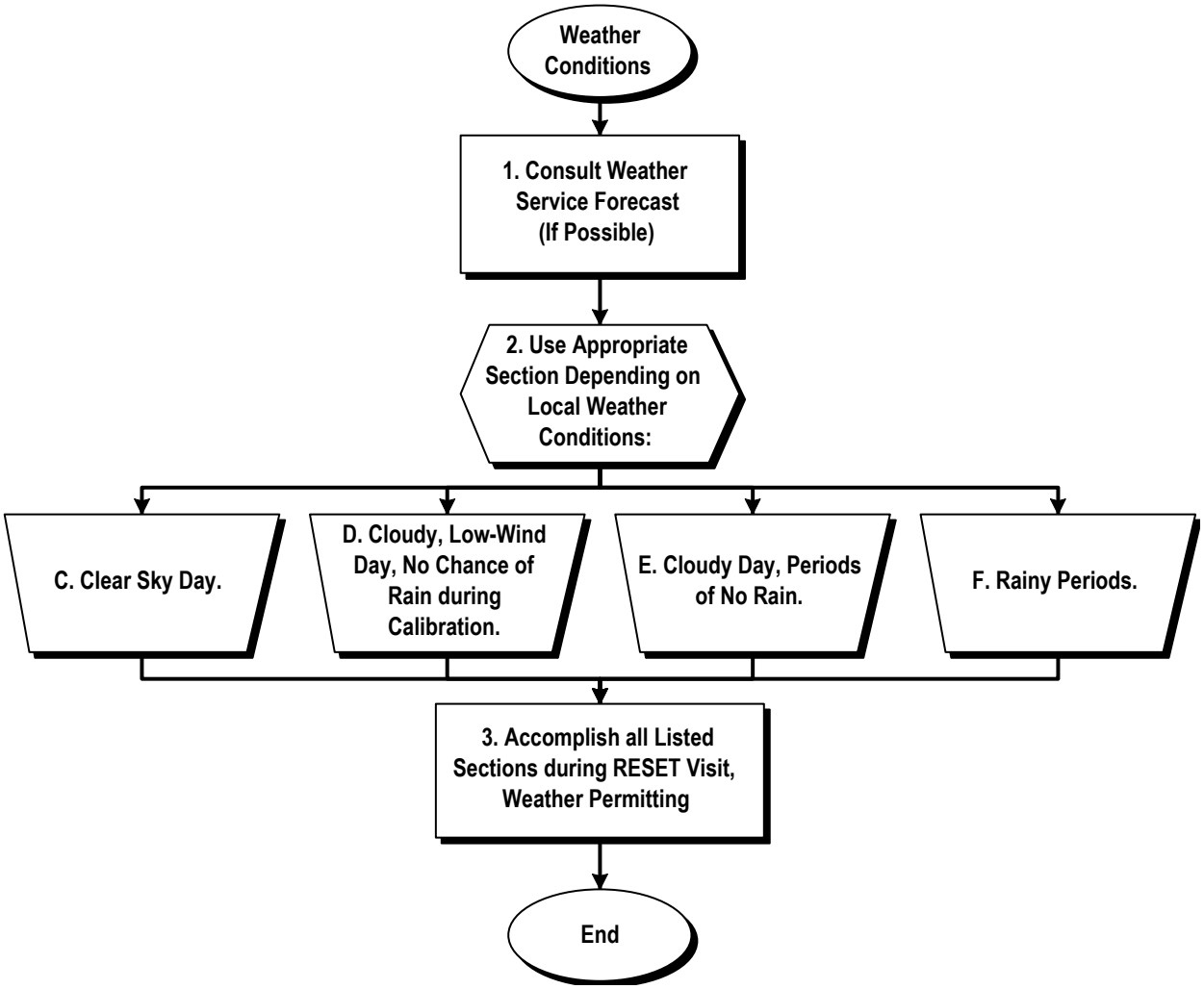
Step A, General Procedure Process Flow Diagram (cont.)



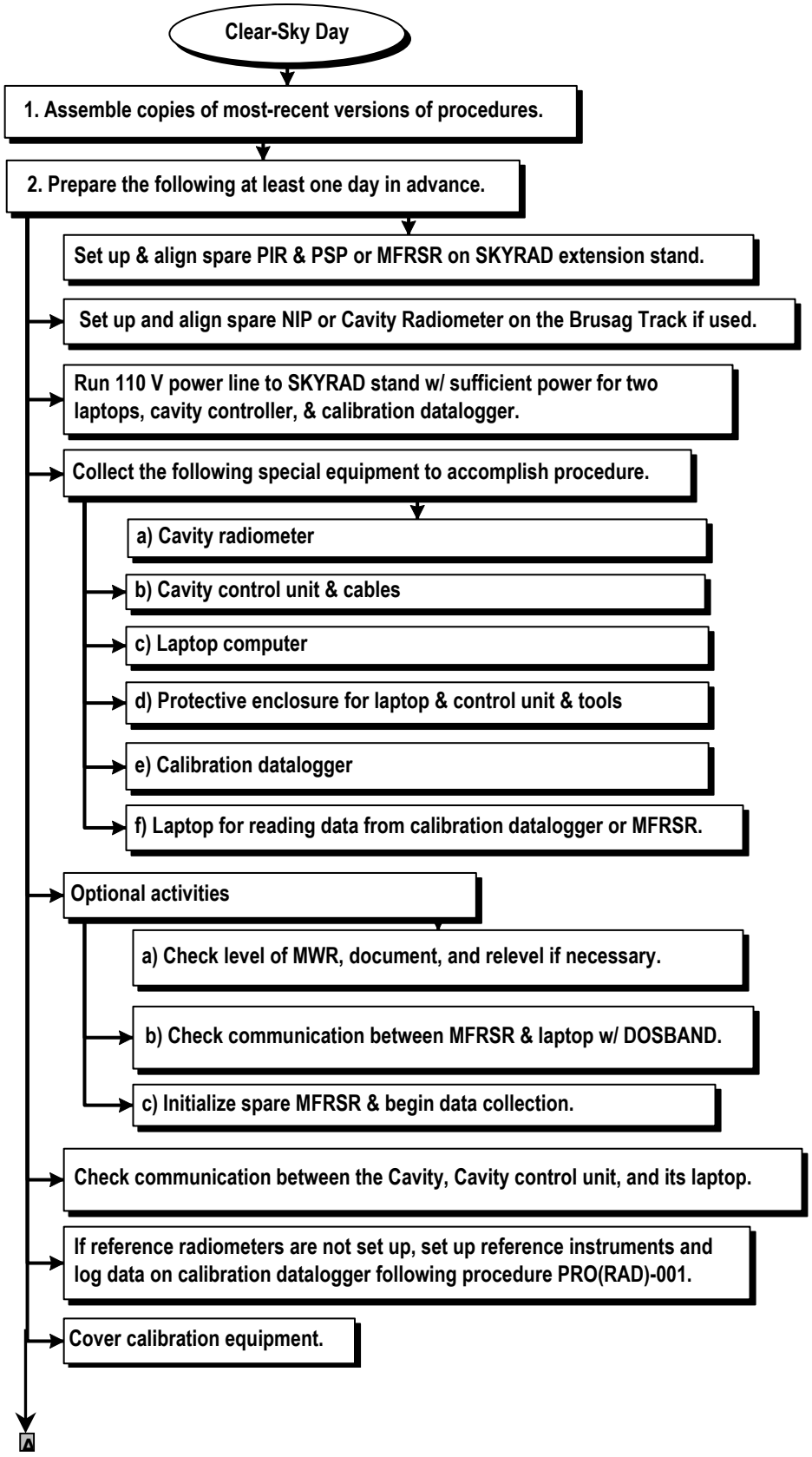
Attachment 2: Step B, Downloading Logger Configurations from ADaM



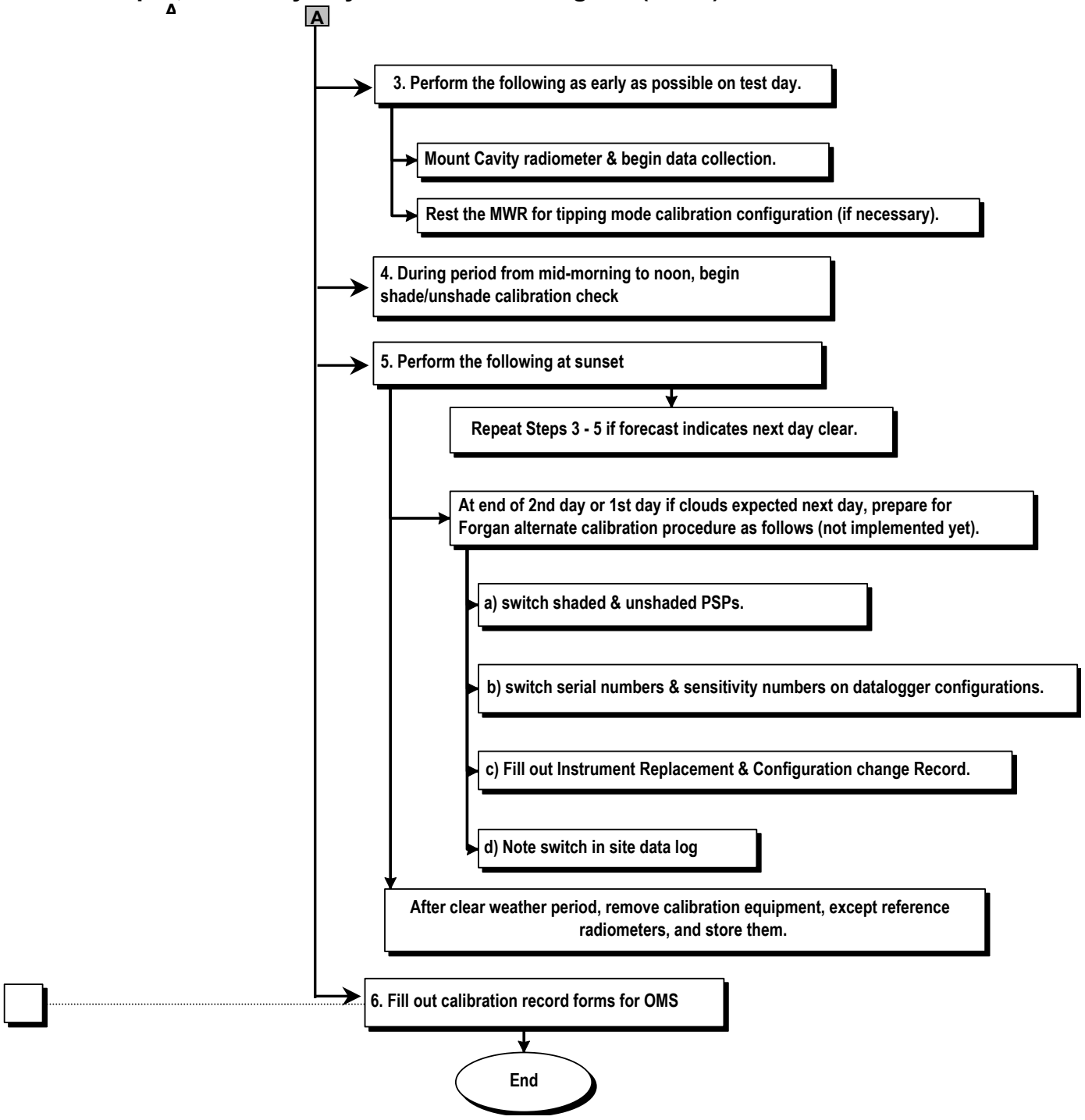
Attachment 3: Step C, Weather Conditions Process Flow Diagram



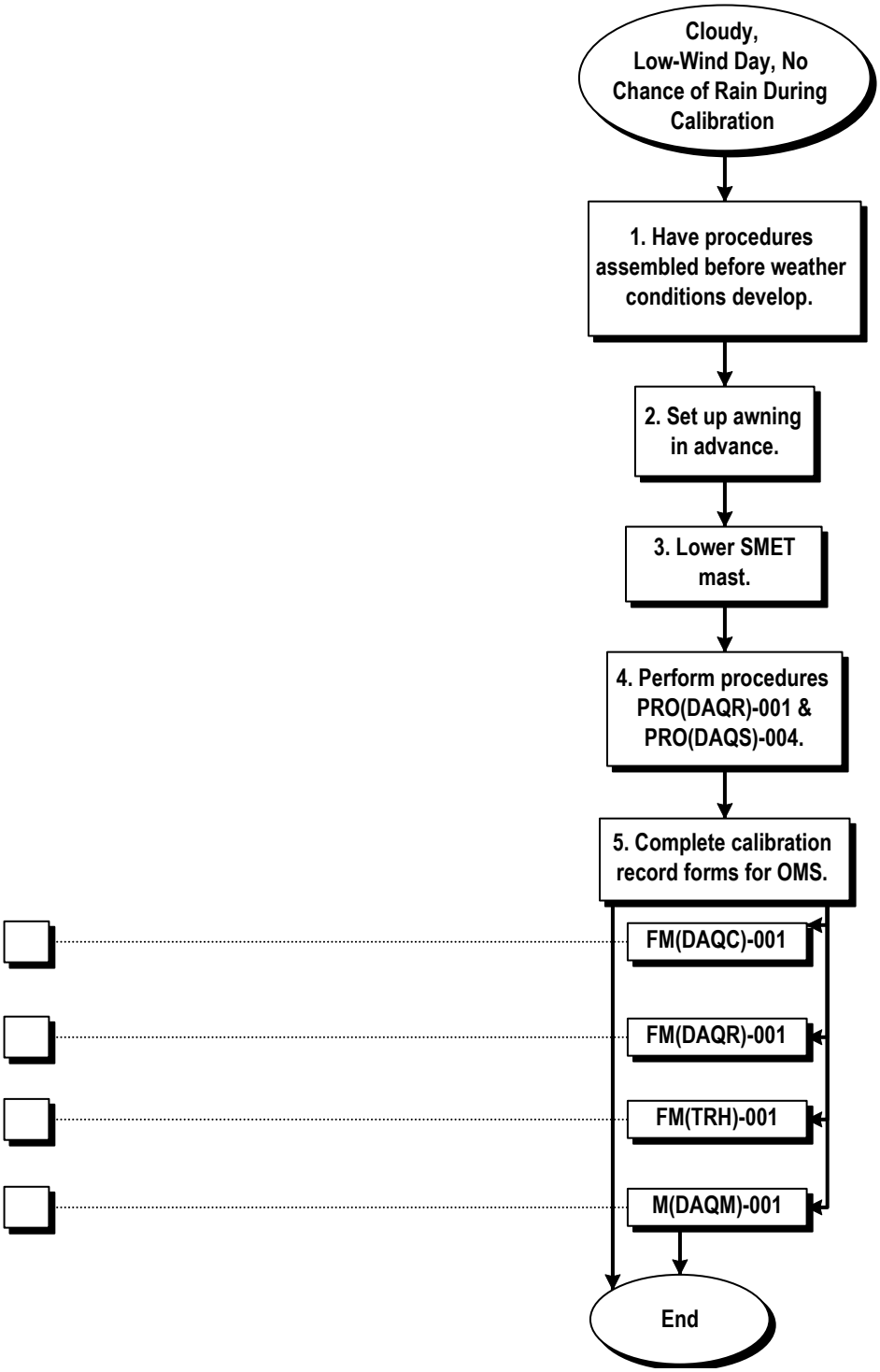
Attachment 4: Step D, Clear-Sky Day Process Flow Diagram



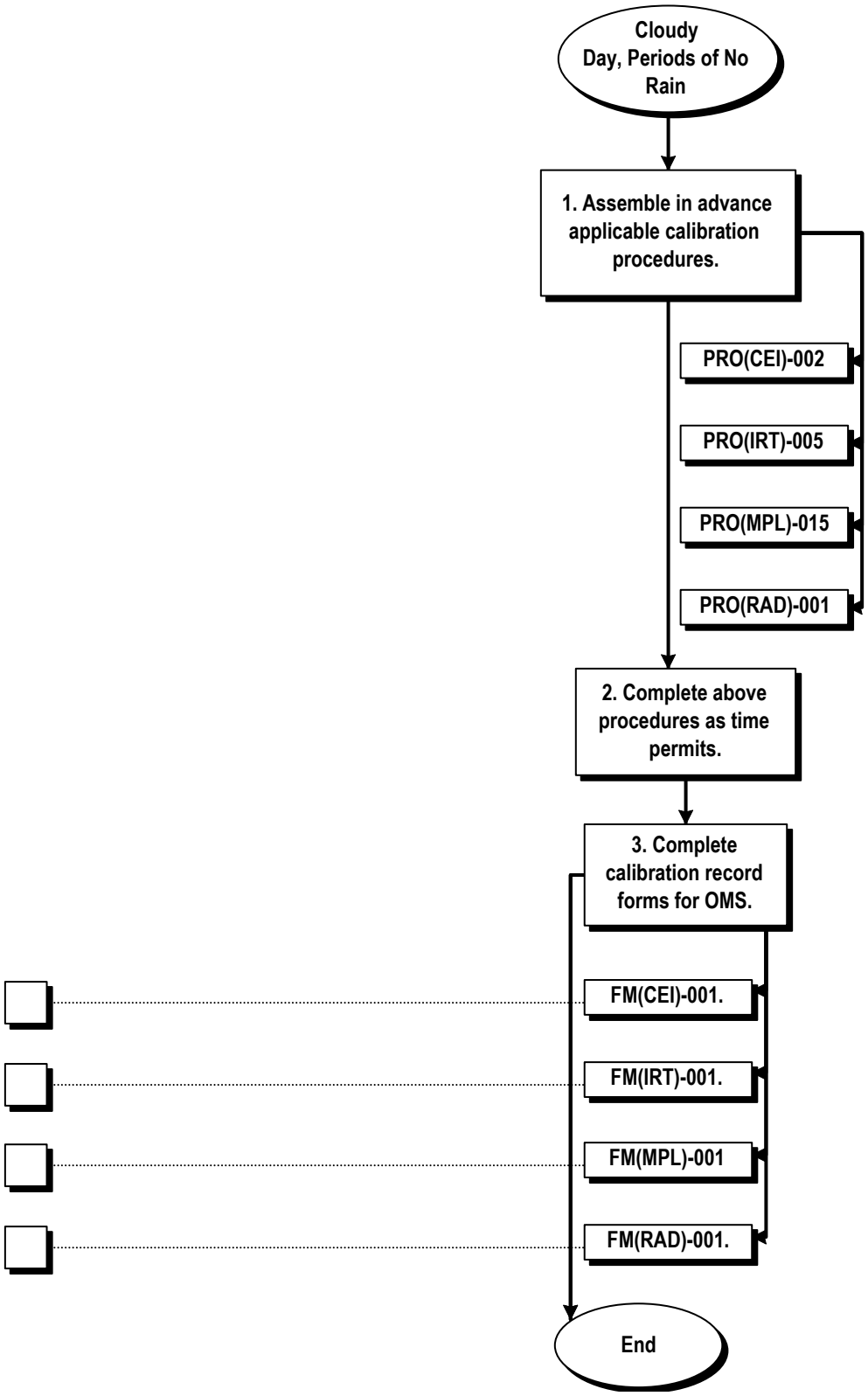
Step D, Clear-Sky Day Process Flow Diagram (Cont.)



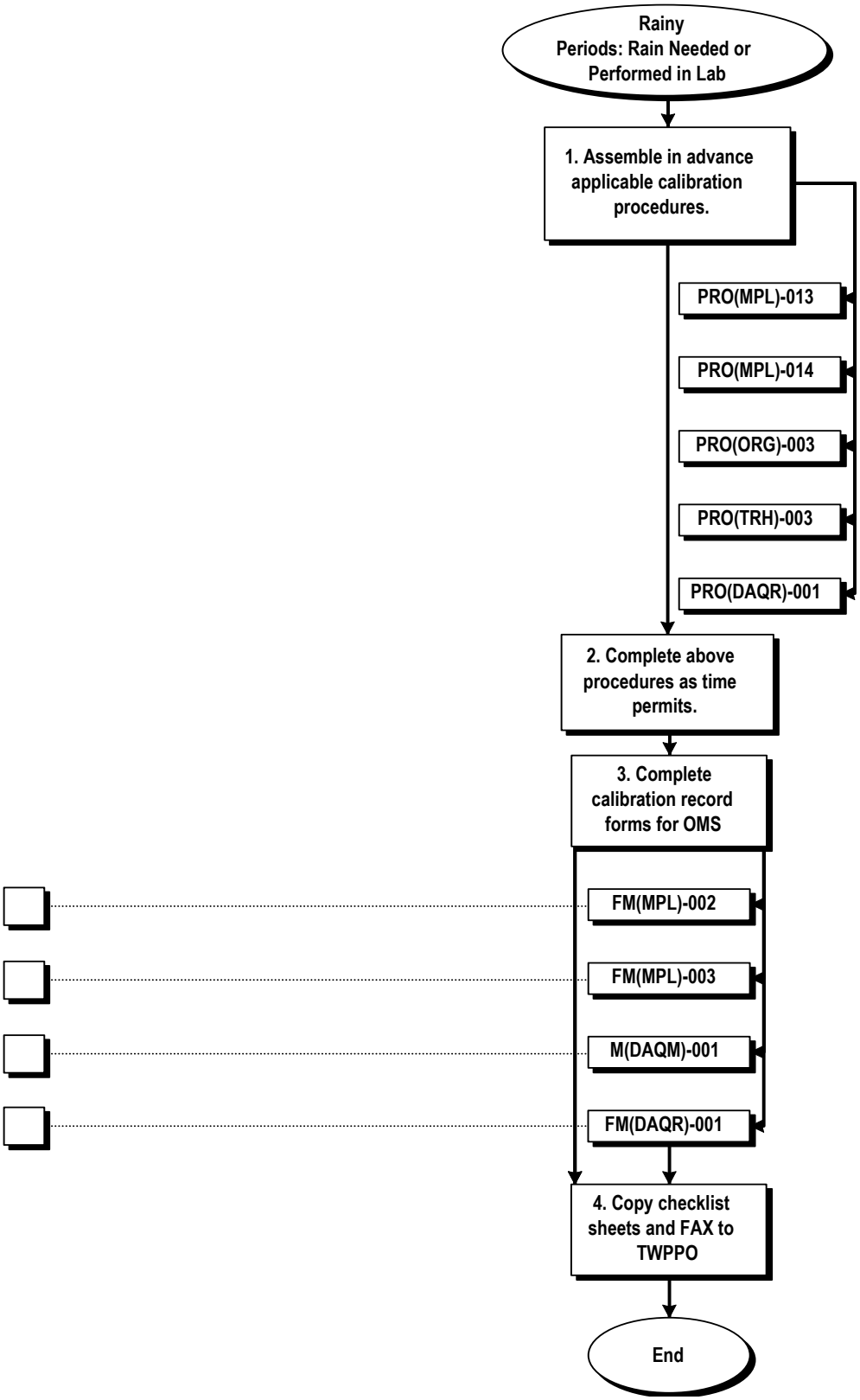
Attachment 5: Step E, Cloudy, Low-Wind Day, No Chance of Rain During Calibration Process Flow Diagram



Attachment 6: Step F, Cloudy Day, Periods of No Rain Process Flow Diagram



Attachment 7: Step G, Rainy Periods (Rain Needed or Perform in Laboratory) Process Flow Diagram



Attachment 8: RESET Calibration Records Completed to Date